C 8

```
   000000000     PPPPPPPPPPPP        CCCCCCCCCCCC     000000000     MMM         MMM
   000000000     PPPPPPPPPPPP        CCCCCCCCCCCC     000000000     MMM         MMM
   000000000     PPPPPPPPPPPP        CCCCCCCCCCCC     000000000     MMM         MMM
000         000  PPP         PPP  CCC              000         000  MMMMMM   MMMMMM
000         000  PPP         PPP  CCC              000         000  MMMMMM   MMMMMM
000         000  PPP         PPP  CCC              000         000  MMMMMM   MMMMMM
000         000  PPP         PPP  CCC              000         000  MMM   MMM   MMM
000         000  PPP         PPP  CCC              000         000  MMM   MMM   MMM
000         000  PPP         PPP  CCC              000         000  MMM   MMM   MMM
000         000  PPPPPPPPPPPP     CCC              000         000  MMM         MMM
000         000  PPPPPPPPPPPP     CCC              000         000  MMM         MMM
000         000  PPPPPPPPPPPP     CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
000         000  PPP              CCC              000         000  MMM         MMM
   000000000     PPP                 CCCCCCCCCCCC     000000000     MMM         MMM
   000000000     PPP                 CCCCCCCCCCCC     000000000     MMM         MMM
   000000000     PPP                 CCCCCCCCCCCC     000000000     MMM         MMM
```

```
_$2

Sym
---
ALL

ASC

BOD
BOD
BOD
BOD
BOD
BOD
BOD
BOD
BUG
BYP
CAN
CAN
CAN
CHE
CHE

CLU
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```

```
**FILE**ID**CLUSCOMM

      CCCCCCCC  LL          UU      UU    SSSSSSSS      CCCCCCCC    OOOOOO    MM      MM  MM      MM
      CCCCCCCC  LL          UU      UU    SSSSSSSS      CCCCCCCC    OOOOOO    MM      MM  MM      MM
    CC          LL          UU      UU  SS            CC          OO      OO  MMMM  MMMM  MMMM  MMMM
    CC          LL          UU      UU  SS            CC          OO      OO  MMMM  MMMM  MMMM  MMMM
    CC          LL          UU      UU  SS            CC          OO      OO  MM  MM  MM  MM  MM  MM
    CC          LL          UU      UU  SS            CC          OO      OO  MM  MM  MM  MM  MM  MM
    CC          LL          UU      UU    SSSSSS      CC          OO      OO  MM      MM  MM      MM
    CC          LL          UU      UU    SSSSSS      CC          OO      OO  MM      MM  MM      MM
    CC          LL          UU      UU          SS    CC          OO      OO  MM      MM  MM      MM
    CC          LL          UU      UU          SS    CC          OO      OO  MM      MM  MM      MM
    CC          LL          UU      UU          SS    CC          OO      OO  MM      MM  MM      MM
    CC          LL          UU      UU          SS    CC          OO      OO  MM      MM  MM      MM     ....
      CCCCCCCC  LLLLLLLLLL  UUUUUUUUUU  SSSSSSSS        CCCCCCCC    OOOOOO    MM      MM  MM      MM     ....
      CCCCCCCC  LLLLLLLLLL  UUUUUUUUUU  SSSSSSSS        CCCCCCCC    OOOOOO    MM      MM  MM      MM     ....
                                                                                                         ....

    LL            IIIIII      SSSSSSSS
    LL            IIIIII      SSSSSSSS
    LL              II      SS
    LL              II      SS
    LL              II      SS
    LL              II      SS
    LL              II        SSSSSS
    LL              II        SSSSSS
    LL              II              SS
    LL              II              SS
    LL              II              SS
    LL              II              SS
    LLLLLLLLLL    IIIIII    SSSSSSSS
    LLLLLLLLLL    IIIIII    SSSSSSSS
```

```
MODULE  OPC$CLUSCOMM    (
                         LANGUAGE (BLISS32),
                         IDENT = 'V04-000'
                        ) =

!****************************************************************************
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!****************************************************************************

!++
! FACILITY:
!
!       OPCOM
!
! ABSTRACT:
!
!       This module contains communications routines used by cluster functions within OPCOM.
!
! Environment:
!
!       VAX/VMS operating system.
!
! Author:
!
!       CW Hobbs
!
! Creation date:
!
!       14 July 1983
!
! Revision history:
!
!       V03-004 CWH3004         CW Hobbs                        18-May-1984
!               Reduce csp messages to two total, one per node to avoid
!               a temporary problem with port overloads.
!
!       V03-003 CWH3169         CW Hobbs                        5-May-1984
!               Second pass for cluster-wide OPCOM:
```

```
!                   - Perform a fairly liberal rewrite of this module using
!                     kernel-ast driven, parallel calls to CSP so that
!                     performance can be much better.
!                   - Return SS$_NOSUCHNODE status if the target node does
!                     not exist at the present time.
!
!       V03-002 CWH3002         CW Hobbs                16-Sep-1983
!               Clean up kernel handler and error messages
!
!
!--
```

```
;    70          0069  1 BEGIN                                                  ! Start of CLUSCOMM
;    71          0070  1
;    72          0071  1 LIBRARY 'SYS$LIBRARY:LIB.L32';
;    73          0072  1 LIBRARY 'LIB$:OPCOMLIB';
;    74          0073  1 REQUIRE 'SHRLIB$:CSPDEF';
;    75          0267  1
;    76          0268  1 FORWARD ROUTINE
;    77          0269  1         CLUSCOMM_COD_ALLOCATE,                         ! Allocate a cluster output descriptor
;    78          0270  1         CLUSCOMM_COD_ERROR : NOVALUE,                  ! Handle an error described by a cod
;    79          0271  1         CLUSCOMM_COD_ERROR_AST : NOVALUE,              ! User mode ast routine for a cod error
;    80          0272  1         CLUSCOMM_DECLARE_KERNEL_AST,                   ! Declare kernel AST to start things moving
;    81          0273  1         CLUSCOMM_OUTPUT_KERNEL_AST : NOVALUE,          ! Handle ast from CSP
;    82          0274  1         CLUSCOMM_SEND,                                 ! Jacket routine to send message to remote node(s)
;    83          0275  1         CLUSCOMM_SEND_ONE,                             ! Send message to single remote node
;    84          0276  1         CLUSCOMM_TARGET_IN_QUEUE;                      ! Count number of times target node in queue
;    85          0277  1
;    86          0278  1 EXTERNAL ROUTINE
;    87          0279  1         CLUSUTIL_FIND_NOD_BY_CSID,
;    88          0280  1         CLUSUTIL_NODE_MESSAGE,
;    89          0281  1         DUMP_LOG_FILE,
;    90          0282  1         SHARE_FAO_BUFFER,
;    91          0283  1         WRITE_LOG_FILE;
;    92          0284  1
;    93          0285  1 GLOBAL                                                 ! Global so that SDA can find them easily
;    94          0286  1         COD_ALLOCATED,                                 ! Count of CODs created
;    95          0287  1         COD_BUSY_COUNT,                                ! Current count of i/os pending
;    96          0288  1         COD_BUSY_MAX    : INITIAL (2),                 ! Maximum number of EXE$CSP_CALLs pending
;    97          0289  1         COD_BUSY_NODE   : INITIAL (1),                 ! Maximum number of EXE$CSP_CALLs pending to single node
;    98          0290  1         COD_ERRORS,                                    ! Count of requests with errors
;    99          0291  1         COD_FLUSHED,                                   ! Count of requests flushed (also count as errors)
;   100          0292  1         COD_REQUESTS,                                  ! Count of requests made
;   101          0293  1         COD_QUEUED,                                    ! Count of requests queued
;   102          0294  1         COD_BUSY_QUEUE  : VECTOR [2, LONG]             ! Queue of CODs pending for I/O
;   103          0295  1                 INITIAL (REP 2 OF (COD_BUSY_QUEUE)),
;   104          0296  1         COD_FREE_QUEUE  : VECTOR [2, LONG]             ! Queue of cods available for use
;   105          0297  1                 INITIAL (REP 2 OF (COD_FREE_QUEUE)),
;   106          0298  1         COD_WAIT_QUEUE  : VECTOR [2, LONG]             ! Queue of cods waiting for actual EXE$CSP_CALL to be queued
;   107          0299  1                 INITIAL (REP 2 OF (COD_WAIT_QUEUE)),
;   108          0300  1         COD_GARBAGE_QUEUE : VECTOR [2, LONG]           ! Pointer to list of virtual memory to deallocate
;   109          0301  1                 INITIAL (REP 2 OF (COD_GARBAGE_QUEUE));
;   110          0302  1 !
;   111          0303  1 ! A macro to put virtual memory back on the queue of garbage to be deallocated
;   112          0304  1 !
;   113          0305  1 MACRO
;   114        M 0306  1         COLLECT_GARBAGE (INP_DESC) =
;   115        M 0307  1                 BEGIN
;   116        M 0308  1                 BIND
;   117        M 0309  1                     desc = (INP_DESC) : VECTOR [, LONG],
;   118        M 0310  1                     garbage = .desc [1] : VECTOR [, LONG];
;   119        M 0311  1                 garbage [2] = .desc [0];                ! Store length as second longword in block
;   120        M 0312  1                 $queue_insert_tail (garbage, cod_garbage_queue);
;   121          0313  1                 END %;
```

```
1 GLOBAL ROUTINE cluscomm_cod_allocate =
1
1 !++
1 ! Functional descripton:
1 !
1 !       This routine allocates a COD for a cluster write
1 !
1 ! Input:
1 !       None.
1 !
1 ! Output:
1 !       None.
1 !
1 ! Routine Value:
1 !       Address of block allocated
1 !--
1
2 BEGIN                                           ! Start of cluscomm_cod_allocate
2
2 LOCAL
2     cod         : $ref_bblock,                  ! cod data structure
2     garb        : REF VECTOR [, LONG],
2     ptr,
2     status;
2
2 !
2 ! If any garbage nodes are in the hopper, send them away.  Garbage is reclaimed this
2 ! way so that the kernel ast routines do not do free_vm calls on memory allocated
2 ! from user mode.
2 !
2 $queue_remove_head (cod_garbage_queue, garb);
2 WHILE .garb NEQ 0
2 DO
3     BEGIN
4     IF NOT (status = opc$free_vm (garb [2], garb))
3     THEN
3         $signal_stop (.status);
3     $queue_remove_head (cod_garbage_queue, garb);
2     END;
2 !
2 ! Get a cod, a Cluster Output Descriptor, if none available on the queue then
2 ! allocate and initialize one.
2 !
2 $queue_remove_head (cod_free_queue, cod);
2 IF .cod EQL 0
2 THEN
3     BEGIN
4     IF NOT (status = opc$get_vm (%ref (cod_k_size), ptr))
3     THEN
3         $signal_stop (.STATUS);
3     cod_allocated = .cod_allocated + 1;
3     cod = .ptr;
3     CH$FILL (0, cod_k_size, .cod);
3     cod [cod_w_size] = cod_k_size;
3     cod [cod_b_type] = %x'77';
2     END;
2 !
```

```
;   180          0371   2 ! Init the block
;   181          0372   2 !
;   182          0373   2 (cod [cod_q_quetime]) = 0;
;   183          0374   2 (cod [cod_q_quetime]+4) = 0;
;   184          0375   2 cod [cod_a_csd] = 0;
;   185          0376   2 cod [cod_l_msglen] = 0;
;   186          0377   2
;   187          0378   2 RETURN .cod;
;   188          0379   1 END;                                                  ! End of cluscomm_cod_allocate


                                                                 .TITLE  OPC$CLUSCOMM
                                                                 .IDENT  \V04-000\

                                                                 .PSECT  $GLOBAL$,NOEXE,2

                                                 00000 COD_ALLOCATED::
                                                                 .BLKB   4
                                                 00004 COD_BUSY_COUNT::
                                                                 .BLKB   4
                                      00000002   00008 COD_BUSY_MAX::
                                                                 .LONG   2                                                    ;
                                      00000001   0000C COD_BUSY_NODE::
                                                                 .LONG   1                                                    ;
                                                 00010 COD_ERRORS::
                                                                 .BLKB   4
                                                 00014 COD_FLUSHED::
                                                                 .BLKB   4
                                                 00018 COD_REQUESTS::
                                                                 .BLKB   4
                                                 0001C COD_QUEUED::
                                                                 .BLKB   4
                                      00000000'  00020 COD_BUSY_QUEUE::
                                                                 .ADDRESS COD_BUSY_QUEUE                                      ;
                                      00000000'  00024           .ADDRESS COD_BUSY_QUEUE                                      ;
                                      00000000'  00028 COD_FREE_QUEUE::
                                                                 .ADDRESS COD_FREE_QUEUE                                      ;
                                      00000000'  0002C           .ADDRESS COD_FREE_QUEUE                                      ;
                                      00000000'  00030 COD_WAIT_QUEUE::
                                                                 .ADDRESS COD_WAIT_QUEUE                                      ;
                                      00000000'  00034           .ADDRESS COD_WAIT_QUEUE                                      ;
                                      00000000'  00038 COD_GARBAGE_QUEUE::
                                                                 .ADDRESS COD_GARBAGE_QUEUE                                   ;
                                      00000000'  0003C           .ADDRESS COD_GARBAGE_QUEUE                                   ;

                                                       _QH_=              COD_GARBAGE_QUEUE
                                                       _QH_=              COD_GARBAGE_QUEUE
                                                       _QH_=              COD_FREE_QUEUE
                                                                 .EXTRN  CLUSUTIL_FIND_NOD_BY_CSID
                                                                 .EXTRN  CLUSUTIL_NODE_MESSAGE
                                                                 .EXTRN  DUMP_LOG_FILE, SHARE_FAO_BUFFER
                                                                 .EXTRN  WRITE_LOG_FILE, OPC$FREE_VM
                                                                 .EXTRN  LIB$STOP, OPC$GET_VM

                                                                 .PSECT  $CODE$,NOWRT,2

                                            007C 00000           .ENTRY  CLUSCOMM_COD_ALLOCATE, Save R2,R3,R4,R5,R6   ; 0314
```

```
                        5E              0C  C2 00002          SUBL2   #12, SP                              ;
                04      AE      0000'   DF  0F 00005 1$:      REMQUE  @_QH_, _T_                           ; 0344
                                        03  1C 0000B          BVC     2$                                   ;
                                04      AE  D4 0000D          CLRL    _T_                                  ;
                                04      AE  D5 00010 2$:      TSTL    GARB                                 ; 0345
                                        15  13 00013          BEQL    3$                                   ;
                                04      AE  9F 00015          PUSHAB  GARB                                 ; 0348
         7E     08      AE              08  C1 00018          ADDL3   #8, GARB, -(SP)                      ;
              0000G     CF              02  FB 0001D          CALLS   #2, OPC$FREE_VM                      ;
                        51              50  D0 00022          MOVL    R0, STATUS                           ;
                        DD              51  E8 00025          BLBS    STATUS, 1$                           ;
                                        22  11 00028          BRB     5$                                   ; 0350
                        56      0000'   DF  0F 0002A 3$:      REMQUE  @_QH_, _T_                           ; 0357
                                        02  1C 0002F          BVC     4$                                   ;
                                        56  D4 00031          CLRL    _T_                                  ;
                                        56  D5 00033 4$:      TSTL    COD                                  ; 0358
                                        36  12 00035          BNEQ    7$                                   ;
                                08      AE  9F 00037          PUSHAB  PTR                                  ; 0361
                04      AE              30  D0 0003A          MOVL    #48, 4(SP)                           ;
                                04      AE  9F 0003E          PUSHAB  4(SP)                                ;
              0000G     CF              02  FB 00041          CALLS   #2, OPC$GET_VM                       ;
                        51              50  D0 00046          MOVL    R0, STATUS                           ;
                        0A              51  E8 00049          BLBS    STATUS, 6$                           ;
                                        51  DD 0004C 5$:      PUSHL   STATUS                               ; 0363
          00000000G     00              01  FB 0004E          CALLS   #1, LIB$STOP                         ;
                                            04 00055          RET                                          ;
                                0000'   CF  D6 00056 6$:      INCL    COD_ALLOCATED                        ; 0364
                        56      08      AE  D0 0005A          MOVL    PTR, COD                             ; 0365
   30           00      6E              00  2C 0005E          MOVC5   #0, (SP), #0, #48, (COD)             ; 0366
                                        66     00063                                                       ;
                08      A6              30  B0 00064          MOVW    #48, 8(COD)                          ; 0367
                0A      A6      77      8F  90 00068          MOVB    #119, 10(COD)                        ; 0368
                                28      A6  7C 0006D 7$:      CLRQ    40(COD)                              ; 0373
                                14      A6  D4 00070          CLRL    20(COD)                              ; 0375
                                20      A6  D4 00073          CLRL    32(COD)                              ; 0376
                        50              56  D0 00076          MOVL    COD, R0                              ; 0378
                                            04 00079          RET                                          ; 0379

; Routine Size:  122 bytes,    Routine Base:  $CODE$ + 0000
;  190        0380  1 GLOBAL ROUTINE cluscomm_declare_kernel_ast =
;  191        0381  1
;  192        0382  1 !++
;  193        0383  1 ! Functional descripton:
;  194        0384  1 !
;  195        0385  1 !       This routine declares an ast to start the I/O, both it and the AST operate in kernel mode
;  196        0386  1 !
;  197        0387  1 ! Input:
;  198        0388  1 !       None.
;  199        0389  1 !
;  200        0390  1 ! Output:
;  201        0391  1 !       None.
;  202        0392  1 !
;  203        0393  1 ! Routine Value:
;  204        0394  1 !       Value from DCLAST
;  205        0395  1 !--
;  206        0396  1
;  207        0397  2 BEGIN                                        ! Start of cluscomm_declare_kernel_ast
;  208        0398  2
;  209        0399  2 RETURN $DCLAST (ASTADR=cluscomm_output_kernel_ast, ASTPRM=0);    ! 0 means start
;  210        0400  2
;  211        0401  1 END;                                         ! End of cluscomm_declare_kernel_ast


                                                                .EXTRN   SYS$DCLAST

                                             0000 00000         .ENTRY   CLUSCOMM_DECLARE_KERNEL_AST, Save nothing   ; 0380
                                          7E   7C 00002         CLRQ     -(SP)                                       ; 0399
                                 0000V    CF   9F 00004         PUSHAB   CLUSCOMM_OUTPUT_KERNEL_AST                  ;
                  00000000G  00           03   FB 00008         CALLS    #3, SYS$DCLAST                              ;
                                               04 0000F         RET                                                  ; 0401

; Routine Size:  16 bytes,    Routine Base:  $CODE$ + 007A
```

```
1 GLOBAL ROUTINE cluscomm_output_kernel_ast (csd : $ref_bblock) : NOVALUE =
1
1 !++
1 ! Functional descripton:
1 !
1 !       This routine is the I/O completion for a EXE$CSP_CALL write, executes in kernel mode
1 !
1 ! Input:
1 !       csd     address of CSD for the transfer
1 !
1 ! Output:
1 !       None.
1 !
1 ! Routine Value:
1 !       None.
1 !--
1
2 BEGIN                                         ! Start of cluscomm_output_kernel_ast
2
2 LOCAL
2     cod : $ref_bblock;
2
2 !
2 ! If the parameter is non-zero, release that block
2 !
2 IF .csd NEQ 0
2 THEN
3     BEGIN
3     cod = .(csd [csd$ab_data]);               ! COD address is first longword of data field
3     !
3     ! Free the CSD and put the message buffer on the list of virtual memory blocks to be deallocated
3     !
3     EXE$DEALLOC_CSD (.csd);
3     collect_garbage (cod [cod_q_msgbuf]);
3     !
3     ! Place the cod in the free queue
3     !
3     $queue_remove (.cod);                     ! Remove it from the queue (should be in the busy queue)
3     $queue_insert_tail (.cod, cod_free_queue);
3     cod_busy_count = .cod_busy_count - 1;
2     END;
2 !
2 ! If we can queue another EXE$CSP_CALL, then do so
2 !
2 cod = .cod_wait_queue [0];
2 WHILE .cod NEQ cod_wait_queue                 ! Loop until we see the end
2     AND
2      .cod_busy_count LSS .cod_busy_max        ! or until we have filled our quota
2 DO
3     BEGIN
3     LOCAL
3         next,
3         nod : $ref_bblock;
3     next = .cod [cod_l_flink];                ! Save the pointer to the next, since we might pull it out
3     nod = .cod [cod_a_nod];                   ! Pointer to the nod block for the system
3     !
3     ! Make sure that the target is still there, this means that the csid stored in the node must be
```

```
3    ! valid and that the node must not be in the departed state.
3    !
3    IF .nod [nod_l_node_csid] NEQ .cod [cod_l_csid]     ! Node has rebooted with a new csid
3      OR
3       .nod [nod_b_state] EQL nod_k_state_departed      ! Node is gone, but not forgotten
3    THEN
4        BEGIN
4        $queue_remove (.cod);                   ! Remove it from the waiting queue
4        cod [cod_l_errstat] = ss$_nodeleave;    ! Give it a reasonable error status
4        cod_flushed = .cod_flushed + 1;         ! Count flushes individually
4        cluscomm_cod_error (.cod);              ! Signal and clean it up
4        END
3    ELSE IF cluscomm_target_in_queue (.cod, cod_busy_queue) LSS .cod_busy_node
3    THEN
4        BEGIN
4        LOCAL
4            status;
4        !
4        ! Remove the cod from the waiting queue
4        !
4        $queue_remove (.cod);
4        !
4        ! Allocate a CSD block for the transfer.  Common fields in the CSD are initialized by
4        ! the allocate routine.
4        !
5        IF NOT (cod [cod_l_errstat] = EXE$ALLOC_CSD (csd$k_length + 4 + .cod [cod_l_msglen]; csd))
4        THEN
5            BEGIN
5            cluscomm_cod_error (.cod);                        ! Signal error and clean up
5            RETURN;                                           ! More serious error, exit the routine
4            END;
4        cod [cod_a_csd] = .csd;                               ! Point the cod at the csd
4        (csd [csd$ab_data]) = .cod;                           ! Store cod address as first longword in csd
4        !
4        ! Set the other message dependent fields in the CSD
4        !
4        csd [csd$w_code] = csd$k_opcom;                       ! Set the OPCOM client code
4        csd [csd$l_sendoff] = (4 + (csd [csd$ab_data])) - .csd; ! Store offset to the actual message
4        csd [csd$l_sendlen] = .cod [cod_l_msglen];            ! Store size of message
4        CH$MOVE (.cod [cod_l_msglen], .cod [cod_a_msgptr],    ! Move the message into the CSD
4                      (4 + (csd [csd$ab_data])));             !  right after the cod address
4        csd [csd$l_recvoff] = csd [csd$l_recvlen] = 0;        ! We do not want a reply
4        csd [csd$a_astadr] = cluscomm_output_kernel_ast;      ! Store address of completion AST routine
4        csd [csd$l_csid] = .cod [cod_l_csid];                 ! Store the target node CSID
5        IF NOT (cod [cod_l_errstat] = EXE$CSP_CALL (.cod [cod_a_csd]))
4        THEN
4            cluscomm_cod_error (.cod)                         ! Signal error and clean up
4        ELSE
5            BEGIN
5            cod_busy_count = .cod_busy_count + 1;             ! Bump the busy count
5            cod_queued = .cod_queued + 1;                     ! Bump the count of those queued
5            $queue_insert_tail (.cod, cod_busy_queue);        ! Put it at the end of the busy queue
5            $gettim (timadr=cod [cod_q_quetime]);             ! Store the current time in the cod
4            END;
3        END;
3    !
3    ! Advance to the next one, using the saved next pointer
```

```
;   327          0516  3       !
;   328          0517  3       cod = .next;
;   329          0518  2       END;
;   330          0519  2   !
;   331          0520  2   ! Check the validity of the queues, crash the system if anything is wrong
;   332          0521  2   !
;   333        L 0522  2   %IF %VARIANT EQL 7
;   334        U 0523  2   %THEN
;   335        U 0524  2   BEGIN
;   336        U 0525  2   EXTERNAL ROUTINE monitor_queue : NOVALUE;
;   337        U 0526  2   monitor_queue (cod_busy_queue, 0);
;   338        U 0527  2   monitor_queue (cod_free_queue, 1);
;   339        U 0528  2   monitor_queue (cod_wait_queue, 2);
;   340        U 0529  2   END;
;   341          0530  2   %FI
;   342          0531  2
;   343          0532  2   RETURN;
;   344          0533  1   END;                                        ! End of cluscomm_output_kernel_ast


                                                   _QH_=                   COD_GARBAGE_QUEUE
                                                   _QH_=                   COD_FREE_QUEUE
                                                   _QH_=                   COD_BUSY_QUEUE
                                                           .EXTRN  EXE$DEALLOC_CSD
                                                           .EXTRN  EXE$ALLOC_CSD, EXE$CSP_CALL
                                                           .EXTRN  SYS$GETTIM

                                     03FC 00000            .ENTRY  CLUSCOMM_OUTPUT_KERNEL_AST, Save R2,R3,R4,-  ; 0402
                                                                   R5,R6,R7,R8,R9                              ;
                 59     0000'   CF   9E 00002              MOVAB   COD_BUSY_COUNT, R9                          ;
                 50        04   AC   D0 00007              MOVL    CSD, R0                                     ; 0427
                                23   13 0000B              BEQL    1$                                          ;
                 57        52   A0   D0 0000D              MOVL    82(R0), COD                                 ; 0430
                   00000000G    00   16 00011              JSB     EXE$DEALLOC_CSD                             ; 0434
                 51        20   A7   9E 00017              MOVAB   32(COD), R1                                 ; 0435
                 50        04   A1   D0 0001B              MOVL    4(R1), R0                                   ;
            08   A0             61   D0 0001F              MOVL    (R1), 8(R0)                                 ;
            38   B9             60   0E 00023              INSQUE  (R0), @_QH_+4                               ;
                 50             67   0F 00027              REMQUE  (COD), _T_                                  ; 0439
            28   B9             67   0E 0002A              INSQUE  (COD), @_QH_+4                              ; 0440
                                69   D7 0002E              DECL    COD_BUSY_COUNT                              ; 0441
                 57        2C   A9   D0 00030 1$:          MOVL    COD_WAIT_QUEUE, COD                         ; 0446
                 50        2C   A9   9E 00034 2$:          MOVAB   COD_WAIT_QUEUE, R0                          ; 0447
                 50             57   D1 00038              CMPL    COD, R0                                     ;
                                01   12 0003B              BNEQ    3$                                          ;
                                     04 0003D              RET                                                 ;
            04   A9             69   D1 0003E 3$:          CMPL    COD_BUSY_COUNT, COD_BUSY_MAX                ; 0449
                                01   19 00042              BLSS    4$                                          ;
                                     04 00044              RET                                                 ;
                 58             67   D0 00045 4$:          MOVL    (COD), NEXT                                 ; 0455
                 50        18   A7   D0 00048              MOVL    24(COD), NOD                                ; 0456
            10   A7        2C   A0   D1 0004C              CMPL    44(NOD), 16(COD)                            ; 0461
                                06   12 00051              BNEQ    5$                                          ;
                 04        22   A0   91 00053              CMPB    34(NOD), #4                                 ; 0463
                                0E   12 00057              BNEQ    6$                                          ;
                 50             67   0F 00059 5$:          REMQUE  (COD), _T_                                  ; 0466
```

```
                    1C   A7        223C   8F  3C 0005C          MOVZWL   #8764, 28(COD)                                  ; 0467
                                     10   A9  D6 00062          INCL     COD_FLUSHED                                     ; 0468
                                          7C  11 00065          BRB      8$                                              ; 0469
                                     1C   A9  9F 00067 6$:      PUSHAB   COD_BUSY_QUEUE                                  ; 0471
                                          57  DD 0006A          PUSHL    COD                                             ;
                 0000V   CF               02  FB 0006C          CALLS    #2, CLUSCOMM_TARGET_IN_QUEUE                    ;
                    08   A9               50  D1 00071          CMPL     R0, COD_BUSY_NODE                               ;
                                          73  18 00075          BGEQ     9$                                              ;
                         50               67  0F 00077          REMQUE   (COD), T                                        ; 0479
          51        20   A7  00000056     8F  C1 0007A          ADDL3    #86, 32(COD), R1                                ; 0484
                             00000000G    00  16 00083          JSB      EXE$ALLOC_CSD                                   ;
                    04   AC               52  D0 00089          MOVL     R2, CSD                                         ;
                    1C   A7               50  D0 0008D          MOVL     R0, 28(COD)                                     ;
                         08               50  E8 00091          BLBS     R0, 7$                                          ;
                                          57  DD 00094          PUSHL    COD                                             ; 0487
                 0000V   CF               01  FB 00096          CALLS    #1, CLUSCOMM_COD_ERROR                          ;
                                              04 0009B          RET                                                      ; 0486
                         56          04   AC  D0 0009C 7$:      MOVL     CSD, R6                                         ; 0490
                    14   A7               56  D0 000A0          MOVL     R6, 20(COD)                                     ;
                    52   A6               57  D0 000A4          MOVL     COD, 82(R6)                                     ; 0491
                    0C   A6               05  B0 000A8          MOVW     #5, 12(R6)                                      ; 0495
          50             56               56  C3 000AC          SUBL3    R6, R6, R0                                      ; 0496
                    16   A6          56   A0  9E 000B0          MOVAB    86(R0), 22(R6)                                  ;
                    12   A6          20   A7  D0 000B5          MOVL     32(COD), 18(R6)                                 ; 0497
                         50               56  D0 000BA          MOVL     R6, R0                                          ; 0499
    56    A0        24   B7          20   A7  28 000BD          MOVC3    32(COD), @36(COD), 86(R0)                       ;
                                     1A   A6  7C 000C4          CLRQ     26(R6)                                          ; 0500
                    22   A6        FF35   CF  9E 000C7          MOVAB    CLUSCOMM_OUTPUT_KERNEL_AST, 34(R6)              ; 0501
                    0E   A6          10   A7  D0 000CD          MOVL     16(COD), 14(R6)                                 ; 0502
                         52          14   A7  D0 000D2          MOVL     20(COD), R2                                     ; 0503
                             00000000G    00  16 000D6          JSB      EXE$CSP_CALL                                    ;
                    1C   A7               50  D0 000DC          MOVL     R0, 28(COD)                                     ;
                         09               50  E8 000E0          BLBS     R0, 10$                                         ;
                                          57  DD 000E3 8$:      PUSHL    COD                                             ; 0505
                 0000V   CF               01  FB 000E5          CALLS    #1, CLUSCOMM_COD_ERROR                          ;
                                          13  11 000EA 9$:      BRB      11$                                             ;
                                          69  D6 000EC 10$:     INCL     COD_BUSY_COUNT                                  ; 0508
                                     18   A9  D6 000EE          INCL     COD_QUEUED                                      ; 0509
                    20   B9               67  0E 000F1          INSQUE   (COD), @_QH_+4                                  ; 0510
                                     28   A7  9F 000F5          PUSHAB   40(COD)                                         ; 0511
             00000000G   00               01  FB 000F8          CALLS    #1, SYS$GETTIM                                  ;
                         57               58  D0 000FF 11$:     MOVL     NEXT, COD                                       ; 0517
                                        FF2F  31 00102          BRW      2$                                              ; 0447
                                              04 00105          RET                                                      ; 0533

; Routine Size:  262 bytes,    Routine Base:  $CODE$ + 008A
;   346          0534  1 GLOBAL ROUTINE cluscomm_cod_error (cod : $ref_bblock) : NOVALUE =
;   347          0535  1
;   348          0536  1 !++
;   349          0537  1 ! Functional descripton:
;   350          0538  1 !
;   351          0539  1 !       This routine handles an error in CSP communications, executes in kernel mode.
;   352          0540  1 !       The error is given to a user-mode AST to actually handle
;   353          0541  1 !
;   354          0542  1 ! Input:
;   355          0543  1 !       cod     address of COD for the transfer
;   356          0544  1 !
;   357          0545  1 ! Output:
;   358          0546  1 !       None.
;   359          0547  1 !
;   360          0548  1 ! Routine Value:
;   361          0549  1 !       None.
;   362          0550  1 !--
;   363          0551  1
;   364          0552  2 BEGIN                                    ! Start of cluscomm_cod_error
;   365          0553  2
;   366          0554  2 LOCAL
;   367          0555  2      csd : $ref_bblock;
;   368          0556  2
;   369          0557  2 cod_errors = .cod_errors + 1;
;   370          0558  2 !
;   371          0559  2 ! Deallocate the CSD if present
;   372          0560  2 !
;   373          0561  2 IF (csd = .cod [cod_a_csd]) NEQ 0
;   374          0562  2 THEN
;   375          0563  2     EXE$DEALLOC_CSD (.csd);
;   376          0564  2 !
;   377          0565  2 ! Return any virtual memory to the free list
;   378          0566  2 !
;   379          0567  2 IF .cod [cod_l_msglen] NEQ 0
;   380          0568  2 THEN
;   381          0569  2     collect_garbage (cod [cod_q_msgbuf]);
;   382          0570  2 !
;   383          0571  2 ! Declare an AST in user mode, so that we can use RMS/etc
;   384          0572  2 !
;   385          0573  2 $DCLAST (astadr=cluscomm_cod_error_ast, astprm=.cod, acmode=psl$c_user);
;   386          0574  2
;   387          0575  2 RETURN;
;   388          0576  1 END;                                     ! End of cluscomm_cod_error


                                                      _QH_=               COD_GARBAGE_QUEUE


                                  001C 00000          .ENTRY  CLUSCOMM_COD_ERROR, Save R2,R3,R4                 ; 0534
                        0000'  CF  D6 00002           INCL    COD_ERRORS                                        ; 0557
              54          04   AC  D0 00006           MOVL    COD, R4                                           ; 0561
              50          14   A4  D0 0000A           MOVL    20(R4), CSD                                       ;
                               06  13 0000E           BEQL    1$                                                ;
                    00000000G  00  16 00010           JSB     EXE$DEALLOC_CSD                                   ; 0563
                          20   A4  D5 00016 1$:       TSTL    32(R4)                                            ; 0567
                               11  13 00019           BEQL    2$                                                ;
                          51        20   A4  9E 0001B         MOVAB    32(R4), R1                              ; 0569
                          50        04   A1  D0 0001F         MOVL     4(R1), R0                               ;
                   08     A0             61  D0 00023         MOVL     (R1), 8(R0)                             ;
                0000'     DF             60  0E 00027         INSQUE   (R0), @_QH_+4                           ;
                                         03  DD 0002C  2$:    PUSHL    #3                                      ; 0573
                                    04   AC  DD 0002E         PUSHL    COD                                     ;
                                 0000V   CF  9F 00031         PUSHAB   CLUSCOMM_COD_ERROR_AST                  ;
            00000000G     00             03  FB 00035         CALLS    #3, SYS$DCLAST                          ;
                                             04 0003C         RET                                              ; 0576

; Routine Size:  61 bytes,    Routine Base:  $CODE$ + 0190
```

```
GLOBAL ROUTINE cluscomm_cod_error_ast (cod : $ref_bblock) : NOVALUE =

!++
! Functional descripton:
!
!       This routine signals an error in CSP communications, executes in user mode.
!
! Input:
!       cod     address of COD for the transfer
!
! Output:
!       None.
!
! Routine Value:
!       None.
!--

BEGIN                                               ! Start of cluscomm_cod_error

LOCAL
    leaving,
    dsc : VECTOR [2, LONG],
    nod : $ref_bblock;

nod = .cod [cod_a_nod];
leaving = (.cod [cod_l_errstat] EQL ss$_nodeleave);
IF (NOT .leaving)                                   ! If any other error
  OR
   (NOT .nod [nod_v_node_leaving])                  ! or if the first node_leaving error
THEN
    BEGIN
    !
    ! Put a message in the logfile
    !
    clusutil_node_message (.nod, opc$_cluscomm, false);
    !
    ! If any error besides leaving, then put a message in the logfile about the exact reason
    !
    IF .leaving                                     ! Mark the first message so that we can skip the others
    THEN
        nod [nod_v_node_leaving] = true
    ELSE
        BEGIN
        write_log_file (
            share_fao_buffer (%ASCID %STRING ('Unable to communicate with !AS (!XL), system status code !XL!
                                        '  Current statistics for cluster message activity:!/',
                                        '       Msg desc allocated!8UL     Errors        !8UL!/',
                                        '       Msg requests      !8UL     Msgs flushed  !8UL!/',
                                        '       Msgs queued       !8UL     Current busy  !8UL'),
                                        nod [nod_q_name_desc], .cod [cod_l_csid], .cod [cod_l_errstat],
                                        .cod_allocated, .cod_errors-.cod_flushed,
                                        .cod_requests, .cod_flushed,
                                        .cod_queued, .cod_busy_count));
        !
        ! Write some more arcane, but useful messages if we are debugging
        !
        %IF %VARIANT NEQ 0
```

```
                                                              B 4
OPC$CLUSCOMM                                                  16-Sep-1984 01:20:02    VAX-11 Bliss-32 V4.0-742            Page  15
V04-000                                                       14-Sep-1984 12:50:36    [OPCOM.SRC]CLUSCOMM.B32;1                 (7)

;  447        U 0634  4           %THEN
;  448        U 0635  4           dsc [0] = cod_k_size;  dsc [1] = .cod;
;  449        U 0636  4           dump_log_file (dsc, %ASCID 'Dump of COD used in transfer');
;  450        U 0637  4           dump_log_file (cod [cod_q_msgbuf], %ASCID 'Dump of COD text field');
;  451          0638  4           %FI
;  452          0639  3           END;
;  453          0640  2       END;
;  454          0641  2
;  455          0642  2 $queue_insert_tail (.cod, cod_free_queue);      ! All done, put it back in the queue
;  456          0643  2
;  457          0644  2 RETURN;
;  458          0645  1 END;                                             ! End of cluscomm_cod_error_ast



                                                                 .PSECT  $PLIT$,NOWRT,NOEXE,2

75 6D 6D 6F 63 20 6F 74 20 65 6C 62 61 6E 55 00000 P.AAB:  .ASCII  \Unable to communicate with !AS (!XL), sy\  ;
53 41 21 20 68 74 69 77 20 65 74 61 63 69 6E 0000F                                                           ;
               79 73 20 2C 29 4C 58 21 28 20 0001E                                                           ;
64 6F 63 20 73 75 74 61 74 73 20 6D 65 74 73 00028         .ASCII  \stem status code !XL!/  Current statisti\  ;
6E 65 72 72 75 43 20 20 2F 21 4C 58 21 20 65 00037                                                           ;
               69 74 73 69 74 61 74 73 20 74 00046                                                           ;
20 72 65 74 73 75 6C 63 20 72 6F 66 20 73 63 00050         .ASCII  \cs for cluster message activity:!/\<9>    ;
74 69 76 69 74 63 61 20 65 67 61 73 73 65 6D 0005F                                                           ;
                              09 2F 21 3A 79 0006E                                                           ;
61 63 6F 6C 6C 61 20 63 73 65 64 20 67 73 4D 00073         .ASCII  \Msg desc allocated!8UL     Errors        \  ;
72 72 45 20 20 20 20 20 4C 55 38 21 64 65 74 00082                                                           ;
               20 20 20 20 20 20 20 73 72 6F 00091                                                           ;
75 71 65 72 20 67 73 4D 09 2F 21 4C 55 38 21 0009B         .ASCII  \!8UL!/\<9>\Msg requests      !8UL      \  ;
20 4C 55 38 21 20 20 20 20 20 20 73 74 73 65 000AA                                                           ;
                                 20 20 20 20 000B9                                                           ;
38 21 20 64 65 68 73 75 6C 66 20 73 67 73 4D 000BD         .ASCII  \Msgs flushed !8UL!/\<9>\Msgs queued   \    ;
65 75 65 75 71 20 73 67 73 4D 09 2F 21 4C 55 000CC                                                           ;
                                 20 20 20 64 000DB                                                           ;
75 43 20 20 20 20 20 4C 55 38 21 20 20 20 20 000DF         .ASCII  \    !8UL     Current busy !8UL\<0><0>      ;
4C 55 38 21 20 79 73 75 62 20 74 6E 65 72 72 000EE                                                           ;
                                       00 00 000FD                                                           ;
                                          00 000FF         .ASCII  <0>                                       ;
                                   010E00FD  00100 P.AAA:  .LONG   17694973                                  ;
                                   00000000' 00104         .ADDRESS P.AAB                                    ;

                                                   _QH_=                  COD_FREE_QUEUE


                                                           .PSECT  $CODE$,NOWRT,2

                                        003C 00000         .ENTRY  CLUSCOMM_COD_ERROR_AST, Save R2,R3,R4,R5   ; 0577
                     55       0000'   CF  9E 00002         MOVAB   COD_FLUSHED, R5                            ;
                     5E               08  C2 00007         SUBL2   #8, SP                                     ;
                     53         04    AC  D0 0000A         MOVL    COD, R3                                    ; 0601
                     52         18    A3  D0 0000E         MOVL    24(R3), NOD                                ;
                                      50  D4 00012         CLRL    R0                                         ; 0602
           0000223C  8F         1C    A3  D1 00014         CMPL    28(R3), #8764                              ;
                                      02  12 0001C         BNEQ    1$                                         ;
                                      50  D6 0001E         INCL    R0                                         ;
                     54               50  D0 00020 1$:     MOVL    R0, LEAVING                                ;
```

```
                                                              C  4
OPC$CLUSCOMM                                           16-Sep-1984 01:20:02    VAX-11 Bliss-32 V4.0-742              Page  16
V04-000                                                14-Sep-1984 12:50:36    [OPCOM.SRC]CLUSCOMM.B32;1                   (7)

                         05                54  E9 00023           BLBC     LEAVING, 2$                                ; 0603
          44         2A  A2                03  E0 00026           BBS      #3, 42(NOD), 4$                            ; 0605
                                           7E  D4 0002B  2$:      CLRL     -(SP)                                      ; 0611
                                  00058253 8F  DD 0002D           PUSHL    #361043
                                           52  DD 00033           PUSHL    NOD
                      0000G  CF            03  FB 00035           CALLS    #3, CLUSUTIL_NODE_MESSAGE
                             06            54  E9 0003A           BLBC     LEAVING, 3$                                ; 0615
                         2A  A2            08  88 0003D           BISB2    #8, 42(NOD)                                ; 0617
                                           2C  11 00041           BRB      4$
                                       F0  A5  DD 00043  3$:      PUSHL    COD_BUSY_COUNT                             ; 0629
                                       08  A5  DD 00046           PUSHL    COD_QUEUED
                                           65  DD 00049           PUSHL    COD_FLUSHED                                ; 0628
                                       04  A5  DD 0004B           PUSHL    COD_REQUESTS
          7E         FC  A5                65  C3 0004E           SUBL3    COD_FLUSHED, COD_ERRORS, -(SP)             ; 0627
                                       EC  A5  DD 00053           PUSHL    COD_ALLOCATED
                                       1C  A3  DD 00056           PUSHL    28(R3)                                     ; 0626
                                       10  A3  DD 00059           PUSHL    16(R3)
                                       30  A2  9F 0005C           PUSHAB   48(NOD)
                                    0000'  CF  9F 0005F           PUSHAB   P.AAA                                      ; 0625
                      0000G  CF            0A  FB 00063           CALLS    #10, SHARE_FAO_BUFFER                      ; 0626
                                           50  DD 00068           PUSHL    R0
                      0000G  CF            01  FB 0006A           CALLS    #1, WRITE_LOG_FILE
                         18  B5            63  0E 0006F  4$:      INSQUE   (R3), @_QH_+4                              ; 0642
                                               04 00073           RET                                                 ; 0645

; Routine Size:  116 bytes,    Routine Base:  $CODE$ + 01CD
```

```
1 GLOBAL ROUTINE CLUSCOMM_SEND (CSID, MSG_LEN, MSG_PTR) =          %SBTTL 'CLUSCOMM_SEND (CSID, MSG_LEN, MSG_PT
1
1 !++
1 ! Functional description:
1 !
1 !       Jacket routine to send a message to remote node(s), and wait for completion.
1 !
1 ! Input:
1 !
1 !       CSID    - Id of target node, -1 for broadcast to all nodes except local
1 !       MSG_LEN - Length of message
1 !       MSG_PTR - Address of message
1 !
1 ! Implicit Input:
1 !
1 !       None.
1 !
1 ! Output:
1 !
1 !       None.
1 !
1 ! Implict output:
1 !
1 !       None.
1 !
1 ! Side effects:
1 !
1 !       Messages will be sent to remote nodes.
1 !
1 ! Routine value:
1 !
1 !       Status from comm primitive.
1 !--
1
2 BEGIN                                                 ! Start of CLUSCOMM_SEND
2
2 EXTERNAL
2       GLOBAL_STATUS   : BITVECTOR [32],
2       LCL_CSID        : LONG,
2       NOD_HEAD        : VECTOR [2, LONG];
2
2 LOCAL
2       FINAL_STAT      : LONG,
2       NOD             : $ref_bblock,
2       STATUS          : LONG;
```

```
2 !
2 ! Assume success for final status
2 !
2 FINAL_STAT = SS$_NORMAL;
2 !
2 ! If not in a cluster we are done, return with success
2 !
2 IF NOT .GLOBAL_STATUS [GBLSTS_K_IN_VAXcluster]
2 THEN
2     RETURN .FINAL_STAT;
2 !
2 ! If CSID is -1, send it to everyone
2 !
2 IF .CSID EQL -1
2 THEN
3     BEGIN
3     NOD = .NOD_HEAD [0];
3     WHILE .NOD NEQ NOD_HEAD [0]
3     DO
4         BEGIN
4         LOCAL
4             TARGET;
4         !
4         ! Send to all nodes but local
4         !
4         TARGET = .NOD [NOD_L_NODE_CSID];
4         IF .TARGET NEQ .LCL_CSID
4         THEN
5             BEGIN
5             STATUS = CLUSCOMM_SEND_ONE (.TARGET, .NOD, .MSG_LEN, .MSG_PTR);
5             IF NOT .STATUS
5             THEN
5                 FINAL_STAT = .STATUS;
4             END;
4         !
4         ! Move to the next node
4         !
4         NOD = .NOD [NOD_L_FLINK];
3         END;
3     END
3 !
3 ! CSID is real, send it to a single node
3 !
2 ELSE
3     BEGIN
3     NOD = CLUSUTIL_FIND_NOD_BY_CSID (.CSID);
4     FINAL_STAT = (IF .NOD EQL 0
4                   THEN SS$_NOSUCHNODE
3                   ELSE CLUSCOMM_SEND_ONE (.CSID, .NOD, .MSG_LEN, .MSG_PTR));
2     END;
2
2 RETURN .FINAL_STAT;
1 END;                                          ! End of CLUSCOMM_SEND


                                                  .EXTRN  GLOBAL_STATUS, LCL_CSID
```

```
                                                                       .EXTRN  NOD_HEAD

                                             000C 00000                .ENTRY  CLUSCOMM_SEND, Save R2,R3                  ; 0646
                           53           01   D0 00002                 MOVL    #1, FINAL_STAT                              ; 0694
                           5F   0000G   CF   E9 00005                 BLBC    GLOBAL_STATUS+1, 5$                         ; 0698
              FFFFFFFF     8F      04   AC   D1 0000A                 CMPL    CSID, #-1                                   ; 0704
                                        30   12 00012                 BNEQ    3$
                           52   0000G   CF   D0 00014                 MOVL    NOD_HEAD, NOD                               ; 0707
                           51   0000G   CF   9E 00019 1$:             MOVAB   NOD_HEAD, R1                                ; 0708
                           51           52   D1 0001E                 CMPL    NOD, R1
                                        46   13 00021                 BEQL    5$
                           51      2C   A2   D0 00023                 MOVL    44(NOD), TARGET                             ; 0716
                  0000G    CF           51   D1 00027                 CMPL    TARGET, LCL_CSID                            ; 0717
                                        11   13 0002C                 BEQL    2$
                           7E      08   AC   7D 0002E                 MOVQ    MSG_LEN, -(SP)                              ; 0720
                                        06   BB 00032                 PUSHR   #^M<R1,R2>
                  0000V    CF           04   FB 00034                 CALLS   #4, CLUSCOMM_SEND_ONE
                           03           50   E8 00039                 BLBS    STATUS, 2$                                  ; 0721
                           53           50   D0 0003C                 MOVL    STATUS, FINAL_STAT                          ; 0723
                           52           62   D0 0003F 2$:             MOVL    (NOD), NOD                                  ; 0728
                                        D5   11 00042                 BRB     1$                                          ; 0708
                                   04   AC   DD 00044 3$:             PUSHL   CSID                                        ; 0736
                  0000G    CF           01   FB 00047                 CALLS   #1, CLUSUTIL_FIND_NOD_BY_CSID
                           52           50   D0 0004C                 MOVL    R0, NOD
                                        07   12 0004F                 BNEQ    4$                                          ; 0737
                           53    028C   8F   3C 00051                 MOVZWL  #652, FINAL_STAT
                                        11   11 00056                 BRB     5$
                           7E      08   AC   7D 00058 4$:             MOVQ    MSG_LEN, -(SP)                              ; 0739
                                        52   DD 0005C                 PUSHL   NOD
                                   04   AC   DD 0005E                 PUSHL   CSID
                  0000V    CF           04   FB 00061                 CALLS   #4, CLUSCOMM_SEND_ONE
                           53           50   D0 00066                 MOVL    R0, FINAL_STAT
                           50           53   D0 00069 5$:             MOVL    FINAL_STAT, R0                              ; 0742
                                             04 0006C                 RET                                                 ; 0743

; Routine Size:  109 bytes,    Routine Base:  $CODE$ + 0241
```

```
1 GLOBAL ROUTINE CLUSCOMM_SEND_ONE (CSID, NOD, MSG_LEN, MSG_PTR) =                    %SBTTL 'CLUSCOMM_SEND_ONE'
1
1 !++
1 ! Functional description:
1 !
1 !       Send a message to a remote node, and wait for completion.
1 !
1 ! Input:
1 !
1 !       CSID    - Id of target node
1 !       NOD     - Address of NOD block for target node
1 !       MSG_LEN - Length of message
1 !       MSG_PTR - Address of message
1 !
1 ! Implicit Input:
1 !
1 !       None.
1 !
1 ! Output:
1 !
1 !       None.
1 !
1 ! Implict output:
1 !
1 !       None.
1 !
1 ! Side effects:
1 !
1 !       Messages will be sent to remote nodes.
1 !
1 ! Routine value:
1 !
1 !       Status from comm primitive.
1 !--
1
2 BEGIN                                                 ! Start of CLUSCOMM_SEND_ONE
2
2 EXTERNAL
2       GLOBAL_STATUS   : BITVECTOR [32];
2
2 LOCAL
2       ARGLIST         : VECTOR [2, LONG],
2       COD             : $ref_bblock,
2       STATUS          : LONG;
2
2 !
2 ! If not in a cluster we are done, return with error.
2 !
2 IF NOT .GLOBAL_STATUS [GBLSTS_K_IN_VAXcluster]
2 THEN
2     RETURN SS$_NOSUCHNODE;
2 !
2 ! Allocate and fill in the COD
2 !
2 COD = CLUSCOMM_COD_ALLOCATE ();                       ! Get a new COD
2 COD [COD_L_CSID] = .CSID;                             ! Keep a copy of the CSID in the COD
2 COD [COD_A_NOD] = .NOD;                               ! Keep the NOD address too
```

```
0801  2 COD [COD_L_MSGLEN] = MAXU (12, .MSG_LEN);        ! Store the length of the message, make sure garbage header
0802  3 IF NOT (STATUS = OPC$GET_VM (COD [COD_L_MSGLEN], COD [COD_A_MSGPTR]))
0803  2 THEN
0804  2     $signal_stop (.STATUS);
0805  2 CH$MOVE (.MSG_LEN, .MSG_PTR, .COD [COD_A_MSGPTR]);
0806  2 !
0807  2 ! Place the cod on the queue of outputs waiting
0808  2 !
0809  2 $QUEUE_INSERT_TAIL (.COD, COD_WAIT_QUEUE);
0810  2 COD_REQUESTS = .COD_REQUESTS + 1;
0811  2 !
0812  2 ! Change to kernel mode to start the transfer, call the ast routine with a zero
0813  2 ! parameter (arglst not relevant)
0814  2 !
0815  2 STATUS = $CMKRNL (ROUTIN = CLUSCOMM_DECLARE_KERNEL_AST, ARGLST = COD);
0816  2 !
0817  2 ! Signal errors.  If ast quota exceeded, then write a message, since it is almost certain that
0818  2 ! kernel ASTs are already active.  If not ast quota error, stop the process.
0819  2 !
0820  2 IF NOT .STATUS
0821  2 THEN
0822  3     BEGIN
0823  3     IF .STATUS NEQ SS$_EXQUOTA
0824  3     THEN
0825  4         $signal_stop (.STATUS)
0826  3     ELSE
0827  3         WRITE_LOG_FILE (%ASCID 'AST quota error in cluster communication');
0828  2     END;
0829  2
0830  2 RETURN .STATUS;
0831  1 END;                                                  ! End of CLUSCOMM_SEND_ONE


                                                                          .PSECT  $PLIT$,NOWRT,NOEXE,2

72 6F 72 72 65 20 61 74 6F 75 71 20 54 53 41  00108 P.AAD:   .ASCII  \AST quota error in cluster communication\  ;
6D 6F 63 20 72 65 74 73 75 6C 63 20 6E 69 20  00117                                                         ;
               6E 6F 69 74 61 63 69 6E 75 6D  00126                                                         ;
                                     010E0028 00130 P.AAC:   .LONG   17694760                                ;
                                     00000000' 00134         .ADDRESS P.AAD                                  ;

                                                    _QH_=             COD_WAIT_QUEUE
                                                             .EXTRN  SYS$CMKRNL

                                                             .PSECT  $CODE$,NOWRT,2

                                    00FC 00000               .ENTRY  CLUSCOMM_SEND_ONE, Save R2,R3,R4,R5,R6,R7  ; 0744
                   5E               0C C2 00002               SUBL2   #12, SP                                    ;
                   06      0000G    CF E8 00005               BLBS    GLOBAL_STATUS+1, 1$                        ; 0792
                   50      028C     8F 3C 0000A               MOVZWL  #652, R0                                   ; 0794
                                       04 0000F               RET                                                ;
            FD3D   CF               00 FB 00010 1$:          CALLS   #0, CLUSCOMM_COD_ALLOCATE                  ; 0798
                   6E               50 D0 00015               MOVL    R0, COD                                    ;
                   56               6E D0 00018               MOVL    COD, R6                                    ; 0799
              10   A6      04       AC D0 0001B               MOVL    CSID, 16(R6)                               ;
              18   A6      08       AC D0 00020               MOVL    NOD, 24(R6)                                ; 0800
```

```
                          50        0C     AC  D0 00025          MOVL    MSG_LEN, R0                                         ; 0801
                          0C               50  D1 00029          CMPL    R0, #12                                             ;
                                           03  1E 0002C          BGEQU   2$                                                  ;
                          50               0C  D0 0002E          MOVL    #12, R0                                             ;
                20        A6               50  D0 00031 2$:      MOVL    R0, 32(R6)                                          ;
                                    24     A6  9F 00035          PUSHAB  36(R6)                                              ; 0802
                                    20     A6  9F 00038          PUSHAB  32(R6)                                              ;
                   0000G  CF               02  FB 0003B          CALLS   #2, OPC$GET_VM                                      ;
                          57               50  D0 00040          MOVL    R0, STATUS                                          ;
                          28               57  E9 00043          BLBC    STATUS, 3$                                          ;
        24   B6      10   BC        0C     AC  28 00046          MOVC3   MSG_LEN, @MSG_PTR, @36(R6)                          ; 0805
                   0000'  DF               66  0E 0004D          INSQUE  (R6), @_QH_+4                                       ; 0809
                                 0000'     CF  D6 00052          INCL    COD_REQUESTS                                        ; 0810
                                           5E  DD 00056          PUSHL   SP                                                  ; 0815
                                  FD70     CF  9F 00058          PUSHAB  CLUSCOMM_DECLARE_KERNEL_AST                         ;
               00000000G  00               02  FB 0005C          CALLS   #2, SYS$CMKRNL                                      ;
                          57               50  D0 00063          MOVL    R0, STATUS                                          ;
                          18               57  E8 00066          BLBS    STATUS, 5$                                          ; 0820
                          1C               57  D1 00069          CMPL    STATUS, #28                                         ; 0823
                                           0A  13 0006C          BEQL    4$                                                  ;
                                           57  DD 0006E 3$:      PUSHL   STATUS                                              ; 0825
               00000000G  00               01  FB 00070          CALLS   #1, LIB$STOP                                        ;
                                               04 00077          RET                                                         ;
                                 0000'     CF  9F 00078 4$:      PUSHAB  P.AAC                                               ; 0827
                   0000G  CF               01  FB 0007C          CALLS   #1, WRITE_LOG_FILE                                  ;
                          50               57  D0 00081 5$:      MOVL    STATUS, R0                                          ; 0830
                                               04 00084          RET                                                         ; 0831

; Routine Size:  133 bytes,    Routine Base:  $CODE$ + 02AE
;  649          0832  1 GLOBAL ROUTINE cluscomm_target_in_queue (cod : $ref_bblock, queue : $ref_bblock) =
;  650          0833  1
;  651          0834  1 !++
;  652          0835  1 ! Functional descripton:
;  653          0836  1 !
;  654          0837  1 !       Check to see if the CSID field in the cod is in any of the CODs in the queue.
;  655          0838  1 !       We assume that we are operating at AST level so that we do not have to worry
;  656          0839  1 !       about interlocking the queue.
;  657          0840  1 !
;  658          0841  1 ! Input:
;  659          0842  1 !       cod     pointer to a cod
;  660          0843  1 !       queue   head of a queue of CODs
;  661          0844  1 !
;  662          0845  1 ! Output:
;  663          0846  1 !       None.
;  664          0847  1 !
;  665          0848  1 ! Routine Value:
;  666          0849  1 !       number of matches in the queue
;  667          0850  1 !--
;  668          0851  1
;  669          0852  2 BEGIN                                           ! Start of cluscomm_TARGET_IN_QUEUE
;  670          0853  2
;  671          0854  2 LOCAL
;  672          0855  2     count,
;  673          0856  2     csid,
;  674          0857  2     head : $ref_bblock,
;  675          0858  2     cur : $ref_bblock;
;  676          0859  2
;  677          0860  2 !
;  678          0861  2 ! Scan the queue, counting the number of times the target appears
;  679          0862  2 !
;  680          0863  2 count = 0;
;  681          0864  2 csid = .cod [cod_l_csid];
;  682          0865  2 head = .queue;
;  683          0866  2 cur = .head [cod_l_flink];
;  684          0867  2 WHILE .cur NEQ .head                             ! Loop until we see the end
;  685          0868  2 DO
;  686          0869  3     BEGIN
;  687          0870  3     IF .csid EQL .cur [cod_l_csid]
;  688          0871  3     THEN
;  689          0872  3         count = .count + 1;
;  690          0873  3     cur = .cur [cod_l_flink];                   ! Get the next cod
;  691          0874  3     END;
;  692          0875  2
;  693          0876  2 RETURN .count;
;  694          0877  1 END;                                            ! End of cluscomm_TARGET_IN_QUEUE



                                     000C 00000          .ENTRY  CLUSCOMM_TARGET_IN_QUEUE, Save R2,R3         ; 0832
                                   52  D4 00002          CLRL    COUNT                                        ; 0863
                     50      04    AC  7D 00004          MOVQ    COD, R0                                      ; 0864
                     53      10    A0  D0 00008          MOVL    16(R0), CSID                                 ;
                     50            61  D0 0000C          MOVL    (HEAD), CUR                                  ; 0866
                     51            50  D1 0000F 1$:      CMPL    CUR, HEAD                                    ; 0867
```

```
                                       0D  13 00012            BEQL    3$                                          ;
                     10    A0          53  D1 00014            CMPL    CSID, 16(CUR)                               ; 0870
                                       02  12 00018            BNEQ    2$                                          ;
                                       52  D6 0001A            INCL    COUNT                                       ; 0872
                           50          60  D0 0001C 2$:        MOVL    (CUR), CUR                                  ; 0873
                                       EE  11 0001F            BRB     1$                                          ; 0867
                           50          52  D0 00021 3$:        MOVL    COUNT, R0                                   ; 0876
                                           04 00024            RET                                                 ; 0877

; Routine Size:  37 bytes,    Routine Base:  $CODE$ + 0333
;  696          0878  1 END                                                   ! End of CLUSCOMM
;  697          0879  0 ELUDOM



;                                       PSECT SUMMARY
;
;       Name                         Bytes                        Attributes
;
;  $GLOBAL$                                  64  NOVEC,  WRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;  $CODE$                                   856  NOVEC,NOWRT,  RD ,  EXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)
;  $PLIT$                                   312  NOVEC,NOWRT,  RD ,NOEXE,NOSHR,  LCL,  REL,  CON,NOPIC,ALIGN(2)



;                               Library Statistics
;
;                                                   -------- Symbols --------        Pages       Processing
;       File                                        Total    Loaded   Percent        Mapped      Time
;
;  _$255$DUA28:[SYSLIB]LIB.L32;1                    18619        12         0        1000          00:01.8
;  _$255$DUA28:[OPCOM.OBJ]OPCOMLIB.L32;1              633        34         5          43          00:00.9



;                                       COMMAND QUALIFIERS

;       BLISS/CHECK=(FIELD,INITIAL,OPTIMIZE)/LIS=LIS$:CLUSCOMM/OBJ=OBJ$:CLUSCOMM MSRC$:CLUSCOMM/UPDATE=(ENH$:CLUSCOMM)

; Size:          856 code + 376 data bytes
; Run Time:         00:22.2
; Elapsed Time:     01:18.8
; Lines/CPU Min:     2375
; Lexemes/CPU-Min: 22248
; Memory Used:  161 pages
; Compilation Complete
```

0289 AH-BT13A-SE
VAX/VMS V4.0

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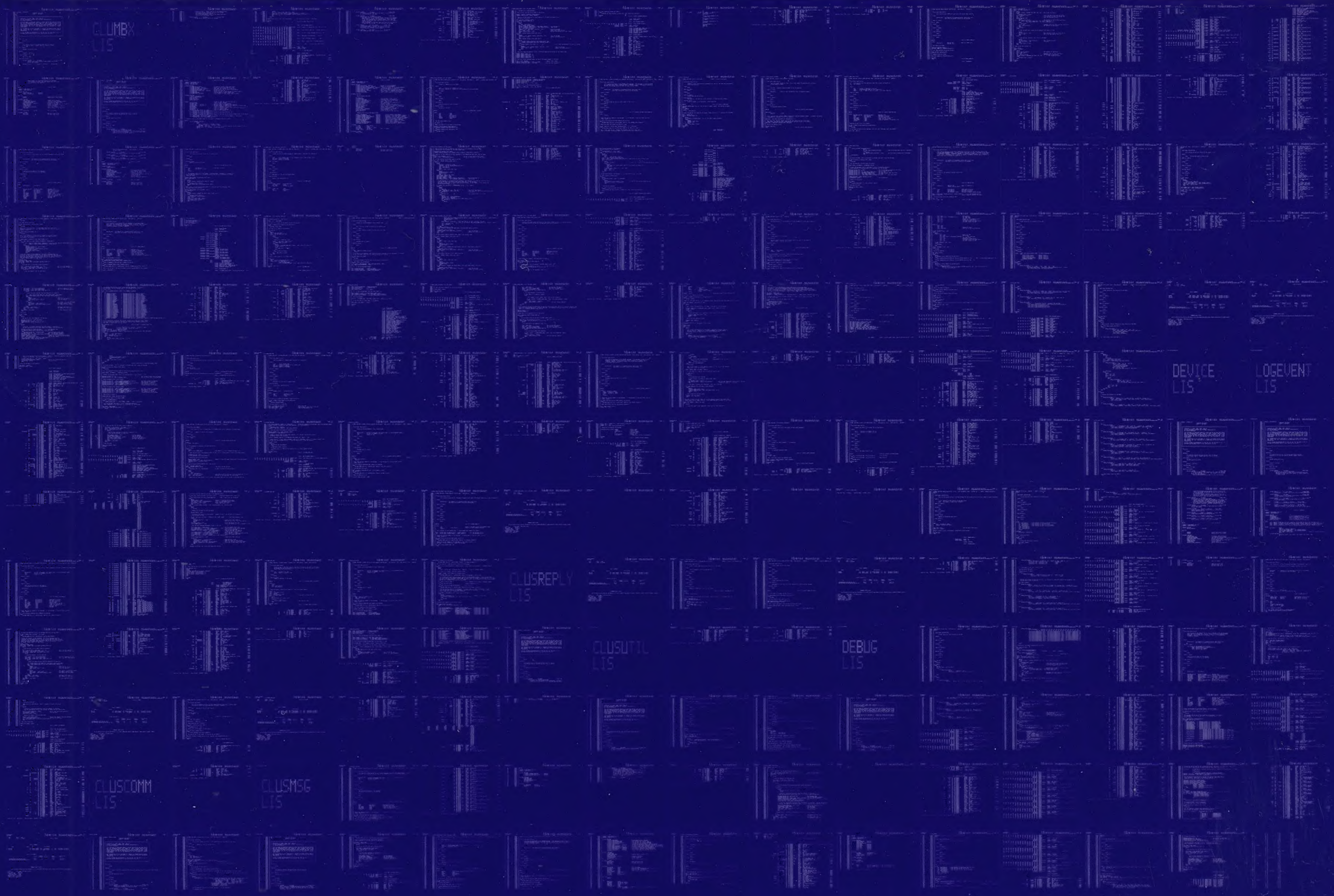

CLUMBX
LIS

DEVICE
LIS

LOGEVENT
LIS

CLUSREPLY
LIS

CLUSUTIL
LIS

DEBUG
LIS

CLUSCOMM
LIS

CLUSMSG
LIS